

3.1.7 Summary of Disposals in the Subsurface Disposal Area

Life spans of the disposal units in the SDA are provided in Figure 3-18. Locations of disposals of TRU and other radioactive waste in the SDA are shown in Figure 3-19. Transuranic waste from Rocky Flats Plant is buried primarily in Pits 1, 2, 3, 4, 5, 6, 9, 10, 11, and 12 and Trenches 1 through 10. Waste buried in the remainder of the SDA is generally considered LLW. Areas, volumes, and dates of operation for SDA trenches, pits, and SVRs are provided in Tables 3-15 through 3-17. Total disposal inventories for Waste Area Group 7 contaminants of potential concern are listed in Section 4.

3.1.8 Soil-Cover Maintenance and Subsidence Repair

The first trenches were opened for waste disposal at the SDA in 1952. Routine contact-handled waste was dumped into trenches and was not covered until the operating week ended. Nonroutine remote-handled waste deposited into trenches was covered immediately. Records of the earliest burials give no indication of depth of soil cover or limits on radiation emitted after the waste was covered with soil. Soil also was periodically added over the filled trenches. In 1962, standard practice was modified to limit the exposure rate to 1 mR/hour at 0.9 m (3 ft) above the surface and to require at least 0.9 m (3 ft) of soil cover.

Neupauer (1995) discussed SDA soil-cover thickness and cited several references dealing with modifications to soil cover in the SDA. In the most recent report on SDA soil cover, Barnes (1989) summarized the soil-cover modifications. Table 3-18 is from Barnes (1989) and shows that soil was added from 1975 to 1979 and again from 1985 to 1987. Total thickness of cover over the pits is a minimum of 1 m (3.3 ft), while minimum cover over the trenches ranges from 0.5 to 0.9 m (1.5 to 3 ft). Overburden thickness in selected locations was verified using geophysical methods and logging Type A probes (see Sections 3.5.4 and 3.6.11, respectively).

In 2004, a project was initiated to increase drainage of various areas of the SDA. The areas selected were based on observation of ponding within the SDA (see Figure 3-20). Drainage was improved in three phases: penetrating the soil dike surrounding the SDA, improving the ditches and culverts in the western and southern ends of the SDA, and regrading the trench disposal area in the southern end of the SDA (see Figure 3-21).

The dike was penetrated in both the western and southern ends of the SDA to provide a direct route for removing water from these two areas. These two penetrations have a one-way flapper valve on the exterior of the SDA, allowing water to flow out of the SDA, but preventing water from flowing back into the SDA (see Figure 3-22). The ditches and culverts—also in the western and southern portions of the SDA—were improved to drain water from disposal areas into ditches and culverts, and then off the SDA through penetrations of the SDA dike. In the southern portion of the SDA, 1,911 m³ (2,500 yd³) of topsoil was placed over the landfill and graded to improve drainage.

In addition to maintaining surface drainage, subsidence is repaired to fill holes that appear in the soil cover. Most subsidence occurs in the spring. Subsidence is expected to continue because of void spaces in the waste zone. Data collected for subsidence occurrences are presented in Table 3-19 (Keck and Seitz 2002). The number of occurrences reported ranges from two in FY 2001 to 30 in FY 1998. However, waste has been exposed on only three occasions—on Pad A in 1998, in Pit 15 in 1999, and in Pit 2 in 2005 (see Table 3-19). Some subsidence areas have been long and narrow (1 × 101 m [3.3 × 331 ft]), and some have been almost square (11 × 12 m [35 × 39 ft]). Depths ranged from 8 cm to 4 m (3 in. to 13 ft). Pad A is the only location in the SDA where subsidence is persistent. Regular collection of subsidence data was discontinued in FY 2003. However, in the spring of 2005, because of heavy rains, a greater-than-normal number of subsidence events were documented and are included in Table 3-19. Figures 3-23 and 3-24 are examples of subsidence in the SDA.

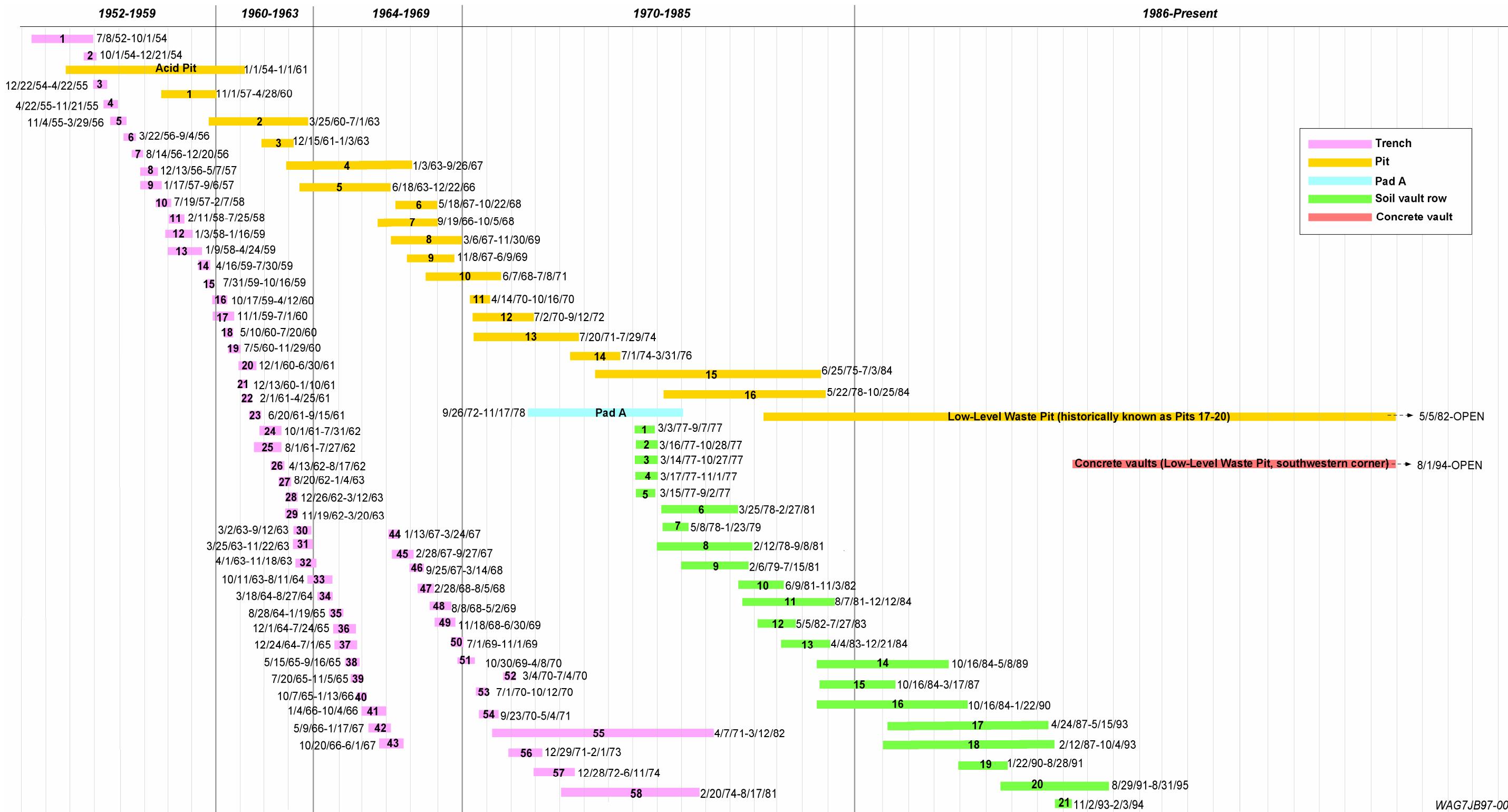


Figure 3-18. Life spans of trenches, pits, Pad A, and soil vault rows at the Subsurface Disposal Area.

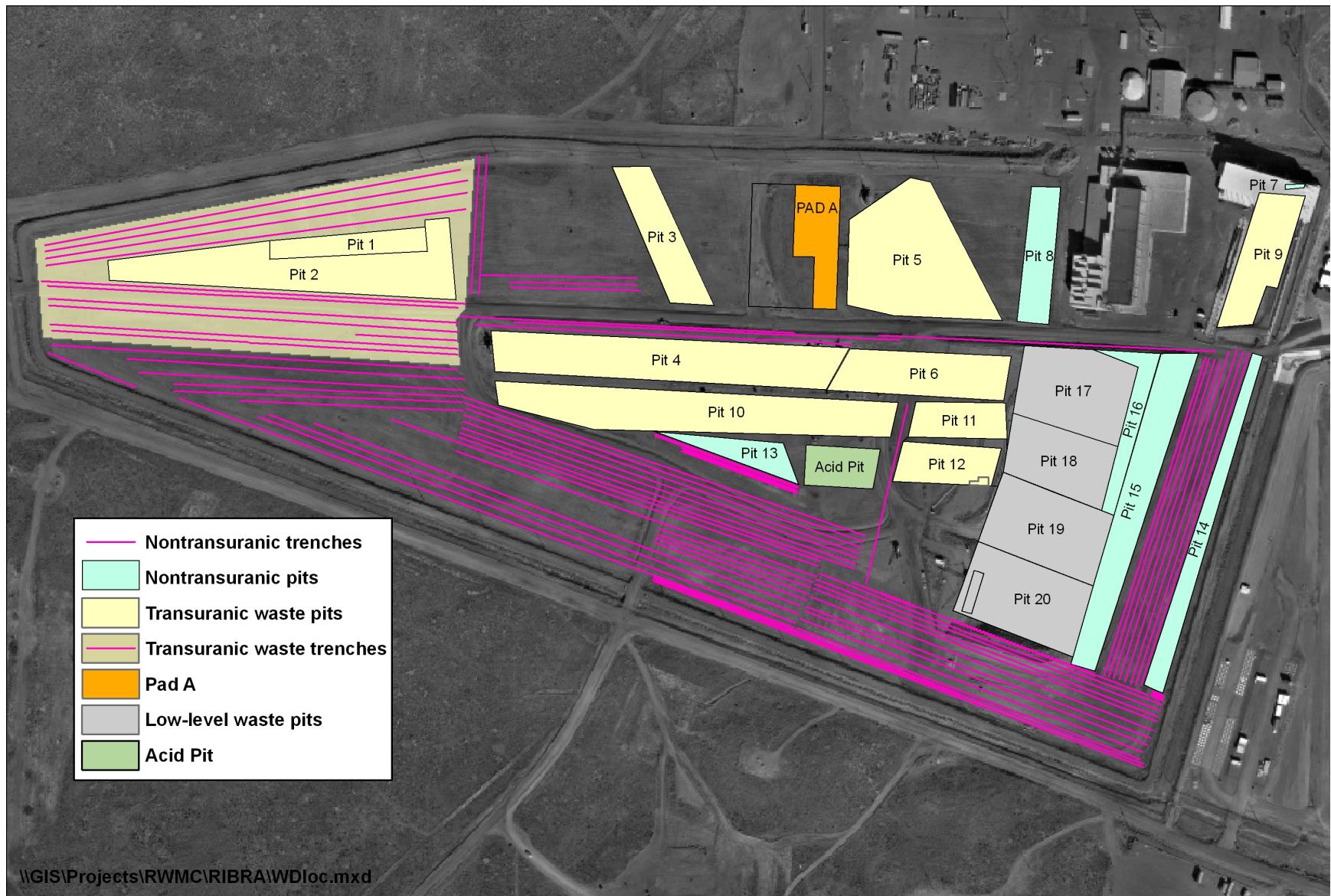


Figure 3-19. Transuranic and low-level waste disposal locations in the Subsurface Disposal Area.

Table 3-15. Dates of operation, primary waste generators, and areas and volumes of Subsurface Disposal Area trenches, including overburden.

Trench	Open to Close Dates	Generator	Area ^a (ft ²)	Area (m ²)	Volume ^a (ft ³)	Volume (m ³)
1 ^b	7/8/52 to 10/1/54	Rocky Flats Plant INL Site	8,043	747	110,000	3,100
2	10/1/54 to 12/21/54	Rocky Flats Plant INL Site	8,015	745	110,000	3,100
3	12/22/54 to 4/22/55	Rocky Flats Plant INL Site	7,777	723	110,000	3,100
4	4/22/55 to 11/21/55	Rocky Flats Plant INL Site	7,812	726	120,000	3,400
5 ^c	11/4/55 to 3/29/56	Rocky Flats Plant INL Site	8,155	758	110,000	3,100
6	3/22/56 to 9/4/56	Rocky Flats Plant	7,826	727	110,000	3,100
7 ^c	8/14/56 to 12/20/56	Rocky Flats Plant	8,120	754	110,000	3,100
8 ^b	12/13/56 to 5/7/57	Rocky Flats Plant	7,826	727	110,000	3,100
9 ^c	1/17/57 to 9/6/57	Rocky Flats Plant	8,610	800	120,000	3,400
10 ^b	7/19/57 to 2/7/58	Rocky Flats Plant INL Site	8,092	752	110,000	3,100
11	2/11/58 to 7/25/58	INL Site	6,279	583	89,000	2,500
12	1/3/58 to 1/16/59	— ^d	12,502	1,162	180,000	5,000
13	1/9/58 to 4/24/59	INL Site	5,439	505	77,000	2,100
14	4/16/59 to 7/30/59	INL Site	10,969	1,019	150,000	4,200
15	7/31/59 to 10/16/59	INL Site	5,495	511	78,000	2,200
16	10/17/59 to 4/12/60	INL Site	10,801	1,003	150,000	4,200
17	11/1/59 to 7/1/60	INL Site	4,270	397	61,000	1,700
18	5/10/60 to 7/20/60	INL Site	7,180	667	100,000	2,800
19	7/5/60 to 11/29/60	INL Site Miscellaneous off-INL Site	9,905	920	140,000	3,900
20	12/1/60 to 6/30/61	INL Site Miscellaneous off-INL Site	7,000	650	99,000	2,800
21	12/13/60 to 1/10/61	INL Site Miscellaneous off-INL Site	2,630	244	37,000	1,000
22	2/1/61 to 4/25/61	INL Site	2,658	247	38,000	1,100
23	6/20/61 to 9/15/61	INL Site	3,098	288	44,000	1,200
24	10/1/61 to 7/31/62	INL Site Miscellaneous off-INL Site	2,948	274	42,000	1,200
25	8/1/61 to 7/27/62	INL Site Miscellaneous off-INL Site	7,001	650	99,000	2,800
26	4/13/62 to 8/17/62	INL Site Miscellaneous off-INL Site	3,115	289	44,000	1,200
27	8/20/62 to 1/4/63	INL Site Miscellaneous off-INL Site	7,013	652	99,000	2,800
28	12/26/62 to 3/12/63	INL Site Miscellaneous off-INL Site	3,097	288	44,000	1,200

Table 3-15. (continued).

Trench	Open to Close Dates	Generator	Area ^a (ft ²)	Area (m ²)	Volume ^a (ft ³)	Volume (m ³)
29	11/19/62 to 3/20/63	INL Site Miscellaneous off-INL Site	2,423	225	34,000	950
30	3/2/63 to 9/12/63	INL Site Miscellaneous off-INL Site	7,014	652	100,000	2,800
31	3/25/63 to 11/22/63	INL Site	3,104	288	44,000	1,200
32	4/1/63 to 11/18/63	Rocky Flats Plant INL Site Miscellaneous off-INL Site	2,457	228	35,000	980
33	10/11/63 to 8/11/64	INL Site	7,013	652	99,000	2,800
34	3/18/64 to 8/27/64	INL Site	7,280	676	100,000	2,800
35	8/28/64 to 1/19/65	INL Site	7,012	94	99,000	2,800
36	12/1/65 to 7/24/65	INL Site	8,610	800	120,000	3,400
37	12/24/64 to 7/1/65	INL Site	7,003	651	99,000	2,800
38	5/15/65 to 9/16/65	INL Site	6,421	597	91,000	2,500
39	7/20/65 to 11/5/65	INL Site	6,993	650	99,000	2,800
40	10/7/65 to 1/13/66	INL Site	7,292	677	100,000	2,800
41	1/4/66 to 10/4/66	INL Site	7,001	650	99,000	2,800
42	5/9/66 to 1/17/67	INL Site	7,952	739	110,000	3,100
43	10/20/66 to 6/1/67	INL Site	6,667	619	95,000	2,700
44	1/13/67 to 3/24/67	INL Site	3,504	326	50,000	1,400
45	2/28/67 to 9/27/67	INL Site	7,959	739	110,000	3,100
46	9/25/67 to 3/14/68	INL Site	6,703	623	95,000	2,700
47	2/28/68 to 8/5/68	INL Site	7,966	740	110,000	3,100
48	8/8/68 to 5/2/69	INL Site	6,685	621	95,000	2,700
49	11/18/68 to 6/30/69	INL Site	7,728	718	110,000	3,100
50	7/1/69 to 11/1/69	INL Site	6,601	613	94,000	2,600
51	10/30/69 to 4/8/70	INL Site	7,987	742	110,000	3,100
52	3/4/70 to 7/4/70	INL Site	6,349	590	90,000	2,500
53	7/1/70 to 10/12/70	INL Site	8,057	749	110,000	3,100
54	9/23/70 to 5/4/71	INL Site	6,373	592	90,000	2,500
55	4/7/71 to 3/12/82	INL Site	8,134	756	110,000	3,100
56	12/29/71 to 2/1/73	INL Site	8,134	756	110,000	3,100
57	12/28/72 to 6/11/74	INL Site	6,346	590	90,000	2,500
58	2/20/74 to 8/17/81	INL Site	6,447	599	91,000	2,500
Total			390,891	35,760	5,480,000	153,830

a. Initial estimates shown in U.S. Customary System units were obtained from Becker et al. (1996). Width of a typical trench is about 7 ft. Areas are consistent with current Geographical Information System data. Depth of trenches is an approximation. Average depth of all the trenches is 15.5 ft, including overburden. Volumes were rounded to the closest 1,000 ft³.

b. For retrievals, see Sections 3.1.5, 3.1.5.4, 3.1.5.4.2.

c. For retrievals, see Sections 3.1.5, 3.1.5.4, 3.1.5.4.2, 3.1.5.4.3.

d. Shipping records are not available for this location.

INL = Idaho National Laboratory

Table 3-16. Dates of operation, primary waste generators, and areas and volumes of Subsurface Disposal Area pits, including overburden.

Pit	Open to Close Dates	Generator	Area ^a (ft ²)	Area (m ²)	Volume ^a (ft ³)	Volume (m ³)
1 ^b	11/1/57 to 4/28/60	Rocky Flats Plant INL Site	24,913	2,315	350,000	9,800
2 ^c	3/25/60 to 7/1/63	Rocky Flats Plant INL Site Miscellaneous off-INL Site	78,425	7,286	1,100,000	31,000
3	12/15/61 to 1/3/63	Rocky Flats Plant INL Site Miscellaneous off-INL Site	41,830	3,886	590,000	16,000
4 ^d	1/3/63 to 9/26/67	Rocky Flats Plant INL Site Miscellaneous off-INL Site	107,082	9,948	1,600,000	45,000
5 ^e	6/18/63 to 12/22/66	Rocky Flats Plant INL Site	108,754	10,104	1,500,000	42,000
6 ^f	5/18/67 to 10/22/68	Rocky Flats Plant INL Site	54,984	5,108	780,000	22,000
7	9/19/66 to 10/5/68	INL Site	100	9	400	11
8	3/6/67 to 11/30/69	INL Site	31,294	2,907	440,000	12,000
9 ^g	11/8/67 to 6/9/69	Rocky Flats Plant INL Site	45,541	4,231	650,000	18,000
10 ^h	6/7/68 to 7/8/71	Rocky Flats Plant INL Site	110,942	10,307	1,600,000	45,000
11 ⁱ	4/14/70 to 10/16/70	Rocky Flats Plant INL Site	24,859	2,310	350,000	9,800
12 ^j	7/2/70 to 9/12/72	Rocky Flats Plant	29,910	2,779	420,000	12,000
13	7/20/71 to 7/29/74	INL Site	19,290	1,792	270,000	7,600
14	7/1/74 to 3/31/76	INL Site	40,704	3,782	580,000	16,000
15	6/25/75 to 7/3/84	INL Site	74,805	6,950	1,100,000	31,000
16	5/22/78 to 10/25/84	INL Site	22,246	2,067	310,000	8,700
LLW Disposal Facility ^k	5/5/82 to Open	INL Site	244,397	22,705	2,474,499	70,070
Concrete Vaults ^l	8/1/94 to Open	INL Site	3,085	287	14,104	400
Acid Pit	1/1/54 to 1/1/61	INL Site	21,291	1,978	300,000	8,400
Total			1,084,452	100,751	14,429,003	404,781

a. Initial estimates shown in U.S. Customary System units were obtained from Becker et al. (1996). Areas are consistent with current Geographical Information System data. Depth of the pits is an approximation. Average depth of all the pits is 14 ft, including overburden. Volumes were rounded to the closest 1,000 ft³.

b. For retrievals, see Sections 3.1.5, 3.1.5.1, 3.1.5.4, 3.1.5.4.2, 3.1.5.4.3.

c. For retrievals, see Sections 3.1.5, 3.1.5.2, 3.1.5.2.1, 3.1.5.4, 3.1.5.4.1, 3.1.5.4.2.

d. For retrievals, see Sections 3.1.5, 3.1.5.7, 3.1.5.8.

e. For retrievals, see Sections 3.1.5, 3.1.5.2, 3.1.5.2.2, 3.1.5.2.4.

f. For retrievals, see Section 3.1.5.8.

g. For retrievals, see Section 3.1.5.6.

h. For retrievals, see Sections 3.1.5, 3.1.5.2, 3.1.5.2.3.

i. For retrievals, see Sections 3.1.5, 3.1.5.2, 3.1.5.2.4, 3.1.5.3.

j. For retrievals, see Sections 3.1.5.3.

k. The LLW Disposal Facility (commonly referred to as the LLW Pit) was historically known as Pits 17-20. The area is the total capacity footprint, and the volume excludes overburden.

l. Concrete vaults are located in the southwestern corner of the LLW Disposal Facility.

INL = Idaho National Laboratory

LLW = low-level waste

Table 3-17. Dates of operation, primary waste generators, and volumes of Subsurface Disposal Area soil vault rows, including overburden.

Soil Vault Row	Open to Close Dates	Generator	Volume ^a (ft ³)	Volume ^a (m ³)
1	3/3/77 to 9/7/77	INL Site	117	3.3
2	3/16/77 to 10/28/77	INL Site	20	0.57
3	3/14/77 to 10/27/77	INL Site	30	0.85
4	3/17/77 to 11/1/77	INL Site	23	0.65
5	3/15/77 to 9/2/77	INL Site	15	0.42
6	3/25/78 to 2/27/81	INL Site	251	7.1
7	5/8/78 to 1/23/79	INL Site	2,472	70
8	2/12/78 to 9/8/81	INL Site	494	14
9	2/6/79 to 7/15/81	INL Site	6,004	170
10	6/9/81 to 11/3/82	INL Site	1,236	35
11	8/7/81 to 12/12/84	INL Site	328	9.3
12	5/5/82 to 7/27/83	INL Site	883	25
13	4/4/83 to 12/21/84	INL Site	3,885	110
14	10/16/84 to 5/8/89	INL Site	989	28
15	10/16/84 to 3/17/87	INL Site	6,358	180
16	10/16/84 to 1/22/90	INL Site	6,358	180
17	4/24/87 to 5/15/93	INL Site	494	14
18	2/12/87 to 10/4/93	INL Site	812	23
19	1/22/90 to 8/28/91	INL Site	8,830	250
20	8/29/91 to 8/31/95	INL Site	9,536	270
21	11/2/93 to 2/3/94	INL Site	11	0.3
Total			49,147	1,391

a. Gross volumes were taken from INEL (1995a, 1995b).

INL = Idaho National Laboratory

Table 3-18. Estimated soil-cover thicknesses.

Disposal Site	Initial Thickness ^a (ft)	Additions 1975 to 1979 ^b (ft)	Additions 1985 to 1987 ^c (ft)	Total Thickness ^d (ft)	Proposed Addition ^e (ft)
Pits					
Pit 1	1.5 to 2.0	1.5 to 2.0	—	3.0 to 4.0	0 to 1.0
Pit 2	2.0 to 3.0	1.5 to 2.0	—	3.5 to 5.0	0 to 1.0
Pit 3	2.0 to 3.0	2.0 to 3.0	—	4.0 to 6.0	2.0 to 3.0
Pit 4	3.0	3.0 to 5.0	0 to 1.0	6.0 to 9.0	0 to 1.0
Pit 5	3.0	1.0 to 3.0	0 to 1.0	4.0 to 7.0	0 to 1.0
Pit 6	3.0	3.0 to 5.0	0 to 2.0	6.0 to 9.0	0 to 1.0
Pit 7	3.0	—	0 to 1.0	3.0 to 4.0	0 to 1.0
Pit 8	3.0	—	1.0 to 3.0	4.0 to 6.0	0 to 1.0
Pit 9	3.0	2.0 to 3.0	0 to 1.0	5.0 to 7.0	0 to 1.0
Pit 10	3.0	3.0 to 5.0	—	6.0 to 8.0	0 to 1.0
Pit 11	3.0	—	2.0 to 4.0	5.0 to 7.0	0 to 1.0
Pit 12	3.0	—	3.0 to 5.0	6.0 to 8.0	0 to 1.0
Pit 13	3.0	—	1.0 to 3.0	4.0 to 6.0	0 to 1.0
Pit 14 to 16	3.0	—	—	3.0	0 to 1.0
Trenches					
1, 5, 7, 9	1.5 to 2.0	1.0 to 3.0	—	2.5 to 5.0	0 to 2.0
2, 3, 4, 6, 8, 10, 11, 13, 15	1.5 to 2.0	—	0.5 to 4.0	2.0 to 6.0	0 to 1.0
12, 14	1.5 to 2.0	—	0 to 1.0	1.5 to 3.0	0 to 1.0
16, 19, 23, 26, 28, 31, 34, 36	2.0 to 3.0	—	0.5 to 3.0	2.5 to 6.0	0 to 1.0
17, 58	2.0 to 3.0	—	1.0 to 4.0	3.0 to 7.0	0 to 1.0
18, 38	2.0 to 3.0	—	0 to 1.0	2.0 to 4.0	0 to 1.0
20, 25, 27, 30, 33, 35, 37, 39	2.0 to 3.0	—	1.0 to 2.0	3.0 to 5.0	0 to 1.0
21, 22, 24, 29, 32	2.0 to 3.0	—	—	2.0 to 3.0	2.0 to 3.0
40, 42, 45, 47, 49, 51, 53, 55	3.0	—	0 to 2.0	3.0 to 5.0	0 to 1.0
41, 43, 46, 48, 50, 52, 54, 56, 57	3.0	—	0 to 1.0	3.0 to 4.0	0 to 1.0
Miscellaneous					
Acid Pit	2.0 to 3.0	—	2.0 to 4.0	4.0 to 7.0	0 to 1.0
Pad A	3.0	— ^f	— ^f	— ^f	— ^f
Soil vault rows	3.0	—	0 to 1.0	3.0 to 4.0	0 to 1.0
Areas between waste	—	—	0 to 5.0	0 to 5.0	0 to 2.0

a. Initial thickness (Barnes 1989, References 8, 11, 22, and 42).

b. 1975 to 1978 addition (Barnes 1989, Reference 20, Drawings 156168, 158246-7, and 196261).

c. 1985 to 1987 addition (Barnes 1989, Reference 45) and comparison of 1980 and 1987 aerial survey contour maps.

d. Does not include soil added in 1970 to 1973, 1980 to 1981, or subsidence maintenance, or soil removed by erosion and animal burrowing (Barnes 1989).

e. Proposed addition (Barnes 1989, markup of Drawing 356697).

f. Pad A is above grade. Surface repairs are conducted as post-remediation maintenance pursuant to the Record of Decision for Operable Unit 7-12 (DOE-ID 1994a). Subsidence repairs are common on Pad A (see Table 3-19).

— = no soil added

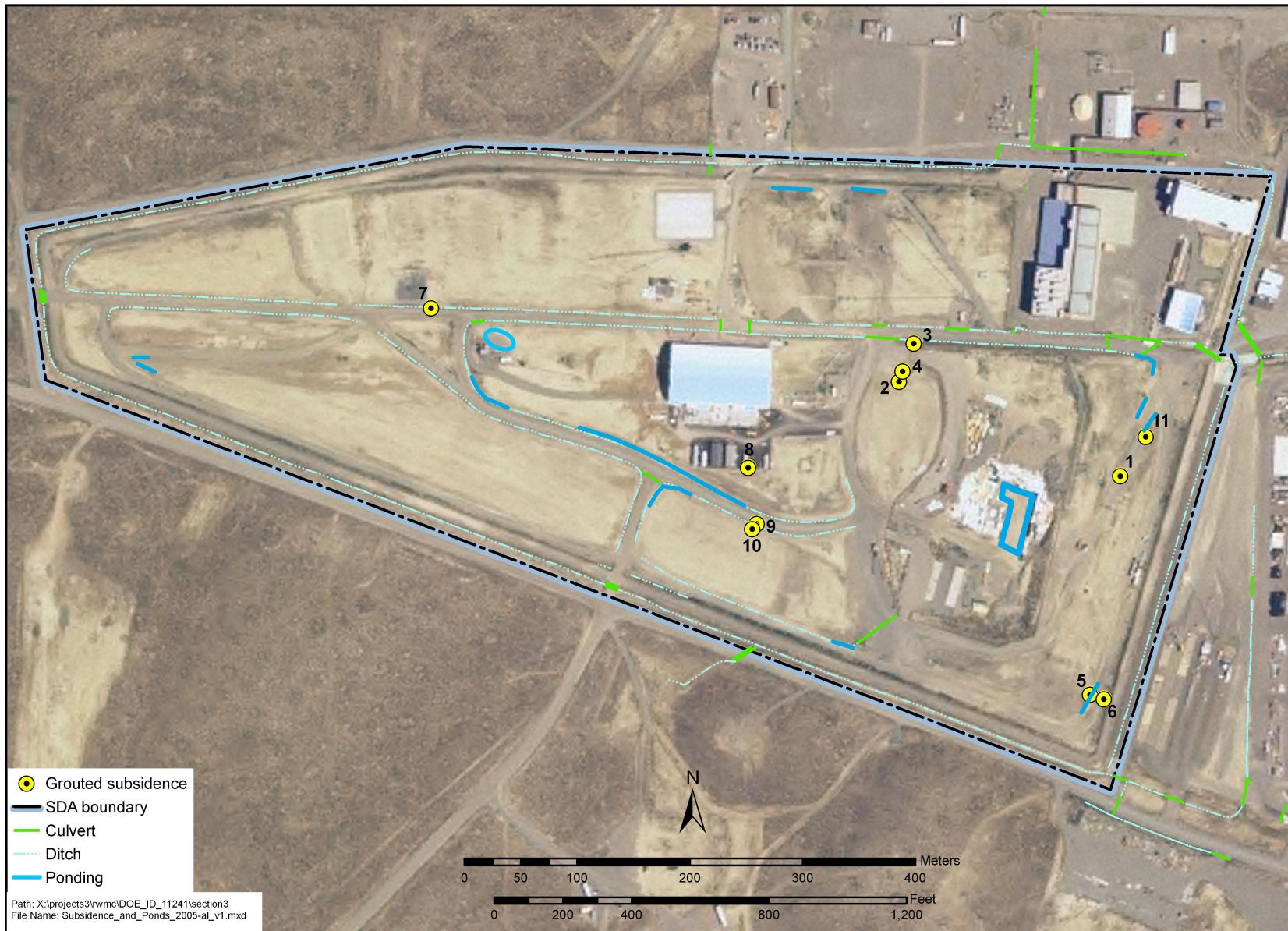


Figure 3-20. Ponding and subsidence in the Subsurface Disposal Area, spring 2005.